

D<sup>1</sup> wherein  $v_{S1}$  is a first spontaneous fission factorial moment for plutonium.

New claims

13. A method of monitoring a sample containing a neutron source having a neutron source mass, comprising:

analyzing signals from a plurality of neutron detectors;

determining a single incidence neutron count rate ( $R_1$ ), a double incidence neutron count rate ( $R_2$ ), and a triple incidence neutron count rate ( $R_3$ ) associated with the neutron source based upon the analyzing;

equating the single, double and triple incidence neutron count rates to a mathematical function related to a spontaneous fission rate ( $F_s$ ), a self-induced fission rate ( $M$ ), a ( $\alpha, n$ ) reaction rate ( $\alpha$ ) and a detection efficiency ( $\epsilon$ );

D<sup>2</sup> assigning a probability distribution to each of the self induced fission rate, the detection efficiency, the  $\alpha, n$  reaction rate and each of the counting rates;

providing probability distribution functions for a trial value;

calculating an overall value of a product of all the probability distribution functions; and

generating a maximal overall value corresponding to the spontaneous fission rate wherein the spontaneous fission rate is associated with the neutron source mass.

14. A method as recited in claim 13, wherein the signals include a series of pulses, comprising:

receiving an initial pulse;

after a preset period of time after the initial pulse is received,

opening an observational interval; and

counting a number of pulses falling within the observational interval, wherein the number of pulses is related to the single, double, triple, and greater numbers of neutron counts.

15. A method according to claim 13 in which the probability distribution assigned to the spontaneous fission rate ( $F_s$ ), the self induced fission rate ( $M$ ), the detection efficiency ( $\epsilon$ ) and the  $\alpha, n$  reaction rate ( $\alpha$ ) is a normal distribution.

16. A method according to claim 13 in which the probability distribution assigned to the spontaneous fission rate ( $F_s$ ), the self induced fission rate ( $M$ ), the detection efficiency ( $\epsilon$ ) and the  $\alpha, n$  reaction rate ( $\alpha$ ) is a flat distribution.

17. A method according to claim 13 in which the probability distribution assigned to the spontaneous fission rate ( $F_s$ ), the self induced fission rate ( $M$ ), the detection efficiency ( $\epsilon$ ) and the  $\alpha, n$  reaction rate ( $\alpha$ ) is a triangular distribution.

D<sup>2</sup>  
18. A method according to claim 15 in which a normal distribution is used for at least one of the counting rates.

19. A method according to claim 16 in which a normal distribution is used for at least one of the counting rates.

20. A method according to claim 17 in which a normal distribution is used for at least one of the counting rates.

21. A method according to claim 15 in which a flat distribution is used for at least one of the counting rates.

22. A method according to claim 16 in which a flat distribution is used for at least one of the counting rates.

23. A method according to claim 17 in which a flat distribution is used for at least one of the counting rates.

24. A method according to claim 15 in which a triangular distribution is used for at least one of the counting rates.

25. A method according to claim 16 in which a triangular distribution is used for at least one of the counting rates.

26. A method according to claim 17 in which a triangular distribution is used for at least one of the counting rates.

27. A method of monitoring a sample containing a neutron source in which:

i) signals from a plurality of neutron detectors are analyzed and the count rates for single, double, and triple incidence of neutrons on the detectors are determined;

ii) the single, double, and triple count rates are equated to a mathematical function related to the spontaneous fission rate, self induced fission rate, detection efficiency and  $\alpha, n$  reaction rate;

iii) a probability distribution is assigned to each of the self induced fission rate, detection efficiency, and  $\alpha, n$  reaction rate and each of the counting rates to provide a probability distribution factor for any given value;

iv) and the value of the product of all the probability distribution factors is increased to give an optimized solution and so provide a value for the spontaneous fission rate which is linked to the mass of the neutron source.

28. A method according to claim 27 in which the signals comprise a series of pulses, each pulse causing a time period to be considered, with other pulses being received in that period being associated with the initial pulse, the number of pulses in the sequence giving the single, double, triple, and greater number of neutron counts.

29. A method according to claim 27 in which the probability distribution assigned to individual variables or counting rates is a normal distribution or a flat distribution or a triangular distribution.

D<sup>2</sup> 30. A method according to claim 27 in which a normal distribution is used for one or more, and most preferably all, the counting rates.

31. A method according to claim 27 in which triangular distributions are used for one or more, and most preferably all, the individual variables, such as detector efficiency, fission rate, multiplication distribution and alpha distribution.


32. A method according to claim 27 in which a flat distribution is used for the fission rate.

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#### REMARKS

Please amend claim 3 and add new claims 13 – 32 that includes a generic claim 13.

Respectfully submitted,  
BEYER WEAVER & THOMAS, LLP

  
Michael J. Ferrazano  
Registration No. 44,105

P.O. Box 778  
Berkeley, CA 94704-0778